PATENT SPECIFICATION

759,575

Date of Application and filing Complete Specification: August 18, 1954

No. 24019/54

Application made in United States of America on August 18, 1953

Complete Specification Published: October 17, 1956

Index at acceptance: —Classes **83(4)**, E11X; **and 94(1)**, C(1F:5D:10P).

COMPLETE SPECIFICATION

Improvements in or relating to a method of Packaging Wire and a Machine for carrying out the method

We, CONTINENTAL CAN COMPANY, INC., a Corporation organised under the laws of the State of New York, United States of America, of 100 East 42nd Street, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the method of packaging wire, or other resilient strand material, and to a machine for carrying out the method.

In the manufacture of wire it is the common practice to draw the material of which the wire is made through one or more dies in order to reduce its diameter to the desired size. When a wire of the desired diameter has been obtained, it is then coiled or packaged and shipped or transported to a point of delivery where it is to be used in manufacturing operations.

In these manufacturing operations the wire is fed to the processing machine from the coil or package in which it is shipped, and it is, of course, desirable that the wire be so packaged or coiled that it may be drawn from the coil or package by the processing machine without kinking or tangling so that the feed of the wire to the machine may be uniform and constant. It is, therefore, desirable to provide a device which will coil or package the wire as it comes from the drawing dies in such a manner that it may be uncoiled or drawn from the coil without any likelihood of tangling or the development of kinks in the wire which would interfere with its constant feed to the processing machine.

In accordance with the invention we provide the method of packaging wire or other resilient strand material which comprises drawing the strand through a casting device and delivering it to a packaging drum in coil-like form, rotating the drum during such delivery at a speed such that the speed of delivery of the strand is less than that of the outer periphery of the interior of the drum, and setting the casting device to form a coil of a different diameter from that obtained from the delivery of the strand to the rotating drum.

According to the invention we also provide a machine for carrying out the method which comprises a wire packaging machine comprising a capstan having a peripheral surface around which the wire passes, a casting device adjacent the capstan and in substantially the same plane as the latter through which the wire is passed, a rotatably mounted drum below the capstan for receiving the wire therefrom, means for pressing the wire against the surface of the capstan and releasing it therefrom to pass into the drum, and means for rotating said drum and capstan at varying relative speeds.

One object of the invention is to provide an improved wire drawing and packaging apparatus.

A further object of the invention is to provide a wire drawing and packaging apparatus which will draw a wire or similar resilient strand material through a die or other apparatus and coil or package the wire in such a manner that it may be removed from the package without tangling or kinking.

A further object of the invention is to provide an improved process for coiling or packaging wire or similar resilient strand material such that the wire is coiled into a package according to a desired pattern which facilitates the drawing of the wire from the package when it is desired to be used.

A still further object of the invention is to provide a process for coiling or packaging wire in which the wire is fed to a rotating container or receiver by a rotating capstan, the arrangement being such that the capstan and drum are rotated by independent means although from a common source of power so that the relative speed of one with respect to the other may be varied in order to produce a coil or package of the desired pattern in the receiver.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In drawings which illustrate embodiments of the invention,

Fig. 1 is a side elevational view of an apparatus embodying the invention and designed

[*Price 3s. 0d.*]

to carry out the improved process;

Fig. 2 is a top plan view of the apparatus shown in Fig. 1;

Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 4 is a sectional view of the receiver or container showing the pattern of a wire coiled or packaged therein;

Fig. 5 is a view similar to Fig. 4 showing a different pattern caused by a change in the relative rotational speeds of the capstan and receiver;

Fig. 6 is a view similar to Fig. 5 showing a further pattern;

Fig. 7 is a view similar to Fig. 4 showing the pattern produced when the speed of the receiver, for example, is constantly varied with respect to that of the capstan; and

Fig. 8 is a side elevational view of a somewhat modified form of the invention.

To illustrate a preferred embodiment of the invention there is shown in the drawings a base 10 which may be suitably supported in a well 11 upon a floor 12. Mounted upon the base 10 are a plurality of standards 13 carrying horizontally disposed rollers 14 upon which rests rotatably a platform 15. Secured to the platform is a short shaft 16, the lower end of which is rotatably supported upon the base 10 by bearings 17.

Detachably mounted upon the table 15 is a container or receiver for the coil or package of wire designated generally by the numeral 18. This member comprises an outer cylindrical barrel or drum 19 and an inner cylindrical hollow core 20, leaving a space 21 between the outer and inner members for receiving the coil of wire. The outer member or drum 19 may be detachably secured to the table 15 in any desired manner such as by the clips 22 so that the drum will be rotated by the rotation of the table.

Rising from the support 10 is a standard 23 which may be provided with a horizontal arm 24. Rotatably carried by this arm by suitable bearings 25 is a shaft 26 to the lower end of which is secured a capstan member 27 having a smooth peripheral surface 28. As will be explained later, the wire which is drawn into the apparatus from the reducing dies and delivered to the receiving member 18 is coiled several times about the smooth periphery of the capstan.

Slidably mounted in the supporting arm 24 is an L-shaped member 29 having a depending end 30 upon which is rotatably mounted a contact wheel 31 which engages the coils of wire on the surface 28 of the capstan. The member 29 is urged inwardly by a tension spring 33 so that the wheel 31 is resiliently pressed against the wire, which is thus maintained in tight frictional engagement with the capstan.

Upon the upper end of the shaft 26 above the supporting arm 24 is a sprocket 35 and a chain 36 is trained about this sprocket wheel and about a sprocket 37 secured to a vertical shaft 38 rotatably supported upon the base 10 by bearings 39 and supported by the arm 24 by bearings 40. Also secured to the shaft 38 is a drive sprocket 42 from which a chain 43 leads to a sprocket 44 (Fig. 2) on a shaft 45, which latter shaft may be driven by any suitable means, the shaft 45 being the source of power which not only drives the capstan 27 but also drives the platform 15 which carries the receiver 18, as will be hereinafter explained.

Secured to the shaft 38 adjacent its lower end is a sprocket 48 from which a sprocket chain 49 leads to a sprocket 50 upon a shaft 51 of a "Reeves" drive designated generally by the numeral 52. This drive, as illustrated more or less diagrammatically, comprises a pair of separable pulley sections 53 upon the shaft 51 and a cooperating pair of pulley sections 54 on a parallel shaft 55. A belt 56 is trained about these pulley sections. A lever 57 is pivoted at 58 intermediate the shafts 51 and 55 and similarly a lever 59 is pivoted at the point 60. The lever 57 is connected to the upper pulley sections 53 and 54 while the lever 59 is connected to the lower pulley sections and one end of each of these levers is threadedly connected to a rotatably threaded adjusting rod 61.

With this construction it will be obvious that a separating movement of the ends of these levers connected to the adjusting rod 61 will effect a separating movement of the pulley sections 54 and a corresponding approaching movement of the pulley sections 53, thus reducing the effective diameter of the pulley formed by the sections 54 and correspondingly increasing the effective diameter of the pulley formed by the sections 53 and change the driving ratio between these shafts 51 and 55. Likewise movement of the levers in the opposite direction will decrease the effective size of the pulley formed by the sections 53 and correspondingly increase the cooperating pulley. The member 61 is provided with right- and left-hand threads so as to effect, when rotated, approaching and separating movements of the ends of the levers 57 and 59 connected thereto.

With the above arrangement the speed of the shaft 55 relatively to the speed of the shaft 51 or the shaft 38 may be varied. The supporting table 15 and the receiver drum 18 are rotated from the shaft 55 by means of a sprocket 62 secured to the lower end of the shaft 55 and a sprocket chain 63 which is trained about the sprocket wheel 62 and also trained about a sprocket wheel 64

secured to the shaft 16 below the table 15. It will, of course, be understood that independently of the Reeves drive shown the speed of the turntable may be varied with respect to the speed of the shaft 38 by changing the relative sizes of the sprocket wheels 62 and 64.

Mounted on a support 66 carried by the standard 23 is a casting device 67 of the usual form. As shown more especially in Fig. 2, the wire 68 which is drawn from the wire drawing device shown diagrammatically at 69 is trained about the capstan 27 and then passes to the casting device 67 after which it is again trained about the capstan for several turns and thereafter delivered to the receiving device 18, as shown at 68*a*, the delivery taking place just after the wire leaves the contact wheel 31 (Fig. 2).

As will be hereinafter explained, it is sometimes desirable to effect a constant variation of the speed of the receiver with respect to the speed of the capstan 27, it being understood that the peripheral speed of the capstan is the speed with which the wire is delivered to the receiver. For constantly varying the speed of the receiver (the speed of the capstan remaining constant) the screw or threaded rod 61 may be continuously rotated by a reversible motor 70 (Fig. 1) through a reducing gear 71. This motor may be controlled by any suitable timing device so that it will operate in one direction for any given interval of time and will then be reversed to operate in the other direction. Thus the screw 61 will be first rotated in one direction to move the levers 57 and 59 apart and will then be moved in the other direction to effect an approaching movement of these levers and again reversed to repeat this cycle. Thus, if desired, the speed of rotation of the receiver may be constantly changed with respect to the speed of the capstan. It will, of course, be understood that if this constant variation in speed is not desired, any desired speed ratio may be established between the capstan and the receiver and this ratio maintained.

As has been stated, the wire 68 is drawn from the wire drawing apparatus by means of the capstan 27 of the apparatus, this capstan furnishing the power to pull the wire through the drawing dies. It is passed once about the capstan 27, thence to the casting device 67 which gives the wire a "set" to form a loop or coil of a predetermined size depending upon the adjustment of this device. Following its passage through the casting device, the wire returns to the capstan 27 about which it is wound several times, as shown in Figs. 1 and 3, and thence it is released by the contact wheel 31 to drop by gravity into the receiver or receiving drum 18 between the inner and outer members 19 and 20.

The operation is so conducted as to cause the wire to form a desired pattern within the receiving drum, this pattern depending upon the speed of the receiving drum with respect to the speed of delivery of the wire thereto (which is determined by the rotational speed of the capstan) and also the set which is given to the wire by the casting device 67.

To effect a preferred pattern of the wire within the receiver, such as that shown in Fig. 4 for example, the receiver is rotated at such a speed that a point midway between the members 19 and 20 will rotate slightly slower than the peripheral speed of the capstan 27 to deposit a coil in the receiver slightly greater than the circle described by this point, and the casting device is so adjusted as to give the wire the desired set to form a loop or coil of a different diameter, preferably greater, than that effected from the speeds of the capstan and barrel. In other words, the coil would tend to lie outwardly from the center of the space 21.

Thus, as the speed of the central portion of the receiver is slightly less than the speed at which the wire is delivered by the capstan 27, the coils deposited in the receiver are somewhat larger than a median circle of the drum but smaller than the size of coil which corresponds to the set of the casting device. As a result of these factors, the coils of wire will be deposited in the pattern shown in Fig. 4. That is, while the length of any one coil is slightly longer than that of a median circle between the members 19 and 20, it will not follow this line, but due to the set of the casting device 67 and due to the centrifugal force acting on the wire as it drops into the barrel, each coil will tend to engage the outer wall of the receiver (that is, the inner surface of the member 19) and lie, at its opposite side, adjacent the surface of the core 20. If the coils are of somewhat greater length than the circumference of a circle midway between the members 19 and 20, they will, as shown in Fig. 4, engage the outer member 19 on one side and the inner member 20 at the opposite side, but if they are set for a coil of a different diameter, one coil will not lie above the other but they will arrange themselves in a progressive pattern, as shown in Fig. 4, thus evenly distributing the wire over the entire area of the receiver.

It has already been stated that the speed with which the wire is fed to the receiver is determined by the speed of the capstan, and it will be obvious that the length of the wire fed to the receiver during one revolution of the latter will determine the length of the wire in one coil in the receiver or will determine the diameter of the coils deposited

in the receiver. That is, assuming a constant speed of the capstan, if the receiver is rotated slowly, the larger will be the coils deposited thereon. If, however, the receiver is rotated at a rapid rate, the shorter length of wire will be fed to the receiver at each rotation and, therefore, the coils will be of less diameter.

Therefore, if it is not desired to have the coils of a size substantially intermediate the inner and outer walls of the receiver, the speed of rotation of the latter may be changed. For example, if the receiver is rotated at a slower speed than that which has been described with reference to Fig. 4, the coils will be larger and, while these coils may engage the outer wall of the container, they will not engage the inner core 20 and the pattern will be that shown in Fig. 5.

On the other hand, if the receiver is rotated at a more rapid speed so that smaller than average size coils will be laid in the receiver, the result will be, as shown in Fig. 6, wherein the coils contact the inner core 20 but will not engage the inner surface of the outer member 19.

If it is desired to have a constantly changing coil pattern in the receiver, this may be effected by the operation of the Reeves drive through the timed reversing motor 70 so that the speed of the receiving drum constantly changes with respect to the speed of the capstan. Such an operation will effect a constantly changing pattern varying between the smaller coils, shown in Fig. 6, and the larger coils, shown in Fig. 5. The limits of such an operation would, of course, be a winding of the wire tightly about the inner core 20 on the other hand and the production of coils as large as permitted by the size of the outer member 19.

It is understood that the capstan furnishes the power for pulling the wire through one or more dies of the wire drawing apparatus and that the end of the wire 68*a* when it leaves the contact wheel 31 is entirely free to drop by gravity into the receiver and is under no tension at this time. It does, however, retain the set which has been given it by the casting device, which is such as to tend to form a coil of a diameter different from that to be expected from the speeds of the capstan and receiver.

When the desired amount of wire has been coiled in the barrel or container, the completed package may be transported to any location where it is desired to be used. It may be drawn directly from the package by a machine by which it is to be processed, and it will be delivered from the package without kinking or tangling. While the wire will usually be drawn from a wire-drawing machine and packaged according to the invention, it may, of course, be supplied in any other way. Instead of being drawn from a wire-drawing machine by the capstan of the present mechanism, it may be drawn from a coil or any means of supply to be packaged according to the improved process illustrated herein.

In Fig. 8 of the drawings there is shown a slightly modified form of the invention wherein the wire is delivered through a tubular guide member to the barrel or container in which the package is to be contained. As illustrated this form of the invention comprises a base 10 upon which is rotatably mounted on the shaft 16 a barrel or container comprising an outer member 19 and an inner core 20, leaving between them a space 21 for receiving the wire.

Rising from the base 10 is a standard 23 provided with a horizontal arm 24. Rotatably mounted at its lower end in the base 10 and at its upper end in the arm 24 is a vertical shaft 38, this shaft being driven by the sprocket chain 43 from any suitable source, such as a shaft on a wire-drawing machine as previously explained.

Also mounted upon the arm 24 is the wire-casting mechanism 67, and the shaft 16 of the container is driven by a sprocket chain 63 which is in turn driven from the variable speed mechanism 52. This variable speed mechanism is driven by a sprocket chain 53 from the shaft 38. A motor 70 and reducing gear 71 serve to actuate the variable speed mechanism. All of the above elements are similar to the corresponding elements described in connection with the modification of the invention shown in Figs. 1 to 7, and no further explanation thereof is needed.

A capstan 75 is carried by a shaft 76 rotatably mounted in the horizontally extending arm 24, the shaft 76 being driven by a sprocket chain 77 from the shaft 38. In this instance the capstan is disposed above the arm 24, and it is in an inverted position with respect to the capstan 27, shown in Fig. 1. That is, the wire 68 is supplied to the lower portion of the capstan and is delivered from an upper portion thereof. As before, the wire is trained around the capstan before passing to the wire-casting device 67 and then given several turns about the capstan before being delivered from the machine. A contact wheel 78 is rotatably mounted upon the arm 24 similarly to the contact wheel 31 and maintains the wire upon the capstan until it is delivered therefrom.

A tubular guide member 79 is supported at its upper end by a bracket 80 in a position adjacent the capstan 75 to receive the free end of the wire 68 from the capstan. This guide member is coiled in spiral form and extends into the space 21 of the container to deliver the wire to the lower por-

tion thereof. The wire being delivered from the capstan and contact wheel 78 will pass by gravity and by the force imparted to it by the capstan and contact wheel through the tube 79 and be delivered to the container or barrel.

It will be understood that the operation of the device is the same as that previously described with respect to the modifications shown in Figs. 1 to 7, and the various patterns in which the wire is laid into the drum may likewise be achieved by the employment of this modified form of the invention. The principal difference between the two modifications is the use of the guide tube 79 to guide the wire into the container and deliver it at the lower portion thereof.

What we claim is:—

1. The method of packaging wire or other resilient strand material which comprises drawing the strand through a casting device and delivering it to a packaging drum in coil-like form, rotating the drum during such delivery at a speed such that the speed of delivery of the strand is less than that of the outer periphery of the interior of the drum, and setting the casting device to form a coil of a different diameter from that obtained from the delivery of the strand to the rotating drum.

2. The method according to Claim 1, wherein the casting device is set to form a coil of larger diameter than that obtained from the delivery of the strand to the rotating drum.

3. The method according to Claim 1 or 2, wherein the drum is rotated, during the delivery of the strand thereto, at a speed such that the speed of the strand is greater than that of a point at the mean diameter of the drum, the casting device being set to form a coil of a diameter different from that of the mean diameter of the drum.

4. The method according to any one of the preceding claims, wherein the strand is drawn through the casting device under tension and delivered by gravity from the drawing device to said packaging drum.

5. The method according to Claim 4, wherein the speed of the strand and drum are controlled to form a coil of predetermined size within the drum.

6. The method according to any one of the preceding claims, wherein the strand is first passed through a die and then passed through said casting device.

7. The method according to Claim 6, wherein the strand is drawn through the die by passing the strand about a rotating capstan.

8. The method according to Claims 5 and 7, wherein the speed of the strand is determined by the speed of the capstan, the speed of the capstan and drum being controlled to form a coil of a predetermined diameter.

9. The method according to Claim 8, wherein the speed of the capstan and that of the drum are controlled so that the coils will lie in progressively advanced positions about the periphery of the drum with the approximate centers of the coils in eccentric relation to the center of the drum.

10. The method according to Claim 9, wherein the drum has inner and outer peripheral walls, the coils contacting the outer peripheral wall at one point.

11. The method according to Claim 1 or 2, wherein the strand is delivered to the drum through a tubular guide member.

12. A wire packaging machine comprising a capstan having a peripheral surface around which the wire passes, a casting device adjacent the capstan and in substantially the same plane as the latter through which the wire is passed, a rotatably mounted drum below the capstan for receiving the wire therefrom, means for pressing the wire against the surface of the capstan and releasing it therefrom to pass into the drum, and means for rotating said drum and capstan at varying relative speeds.

13. A machine according to Claim 12, wherein the means for rotating said drum and capstan at varying relative speeds comprises means for rotating the capstan, means for rotating the drum, and means for varying the angular velocity of the drum with respect to that of the capstan.

14. A machine according to Claim 13, wherein the means for varying the angular velocity of the drum with respect to that of the capstan comprises pulley section cooperating with levers threadably connected to a screw continuously rotated by a reversible motor.

15. A machine according to Claim 13, wherein the means for rotating the drum comprises means other than that for rotating the capstan from a common power source.

16. A machine according to any one of Claims 12 to 15, wherein the capstan is provided with a smooth peripheral surface.

17. A machine according to Claim 16, wherein means is provided for passing the strand about the capstan both before and after it is passed through the casting device.

18. A machine according to Claim 12, wherein the means for pressing the strand against the surface of the capstan comprises a presser wheel rotatably mounted adjacent the capstan.

19. A machine according to Claim 12, wherein a tubular guide member is mounted between the capstan and the drum to guide the wire into the latter.

20. The method of packaging wire or

other resilient strand material substantially as hereinbefore described.

21. A wire packaging machine substantially as hereinbefore described with reference to the accompanying drawings.

STEVENS, LANGNER, PARRY & ROLLINSON,
Chartered Patent Agents,
Agents for the Applicants.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1956.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

Fig. 1.

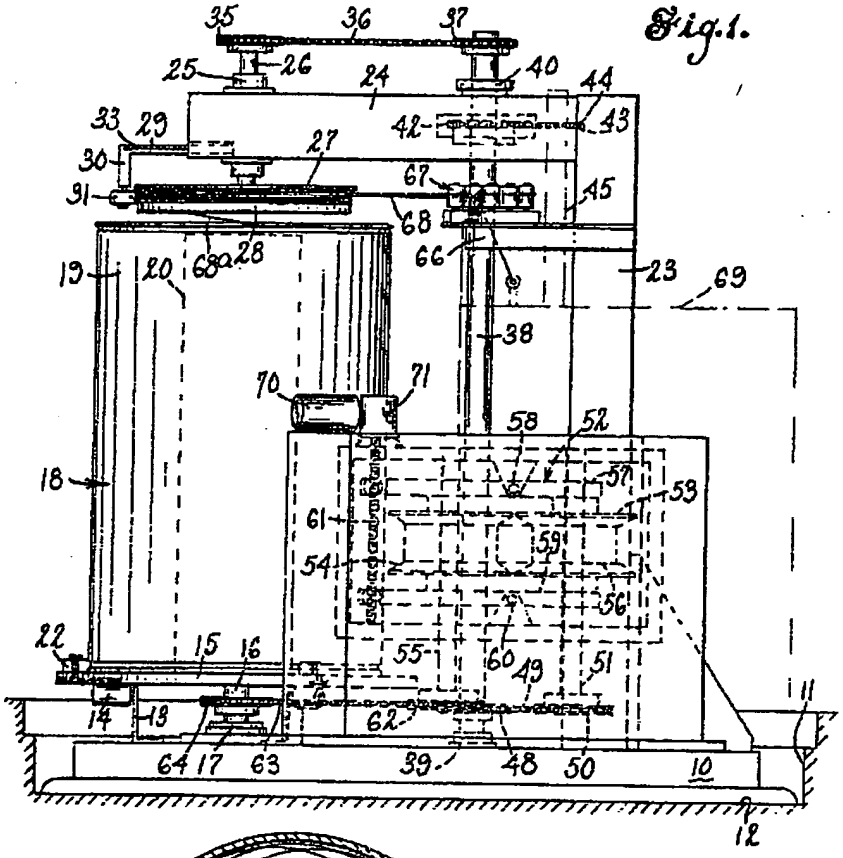
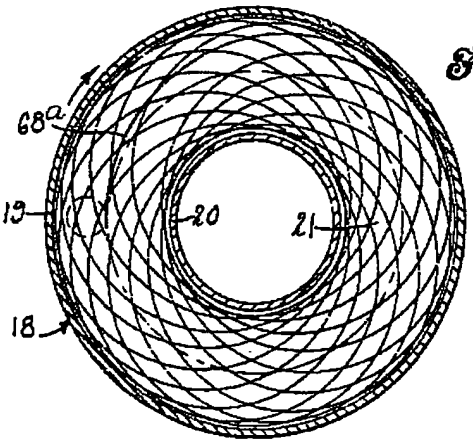

35
36
37
25
26
24
40
44
33
29
42
43
30
27
67
45
31
68
68a
28
66
23
69
19
20
38
70
71
58
52
18
57
59
61
59
54
56
22
15
16
55
60
49
51
14
13
62
64
17
63
39
48
50
10
11
12

Fig. 4.


68a
19
20
21
18

759.575 COMPLETE SPECIFICATION

4 SHEETS

This drawing is a reproduction of the Original on a reduced scale.

SHEETS 1 & 2

Fig. 2

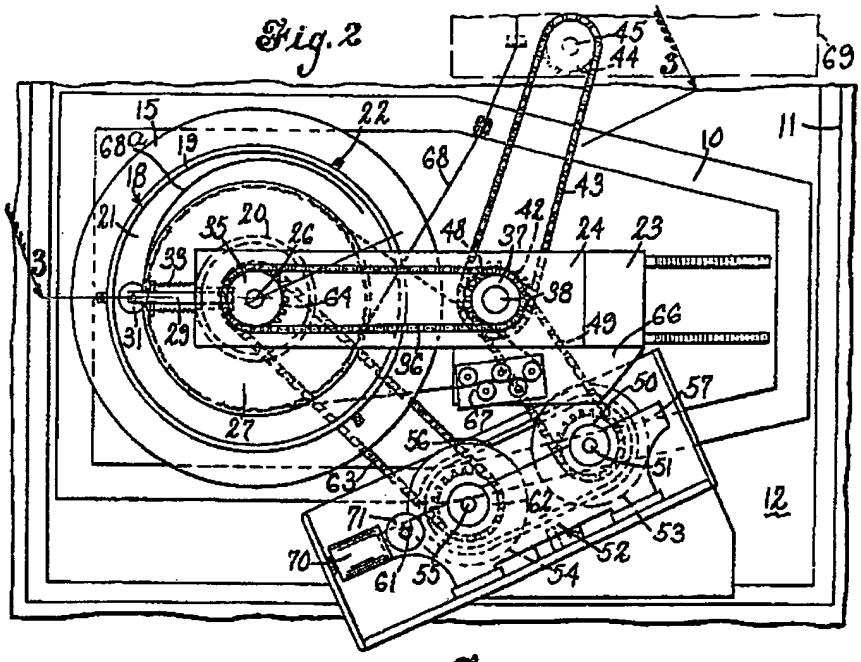


Fig. 5.

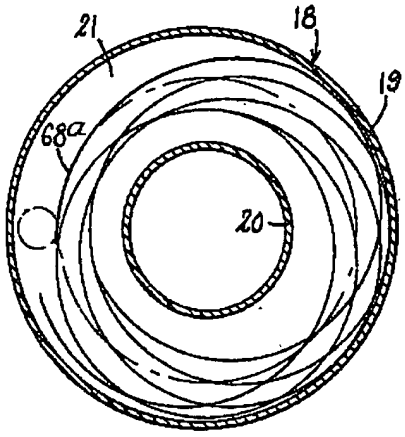
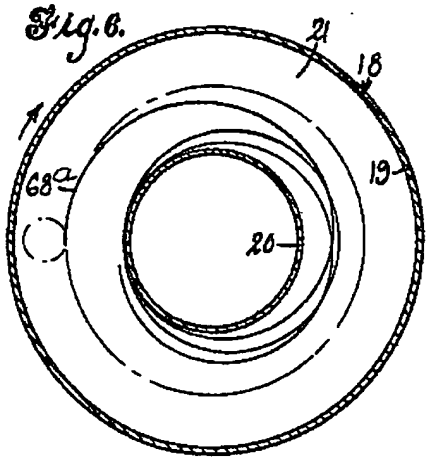


Fig. 6.



759,575 COMPLETE SPECIFICATION
4 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

Fig. 1.

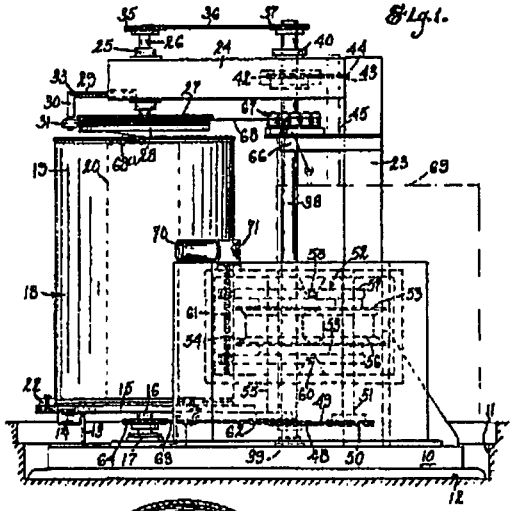


Fig. 2.

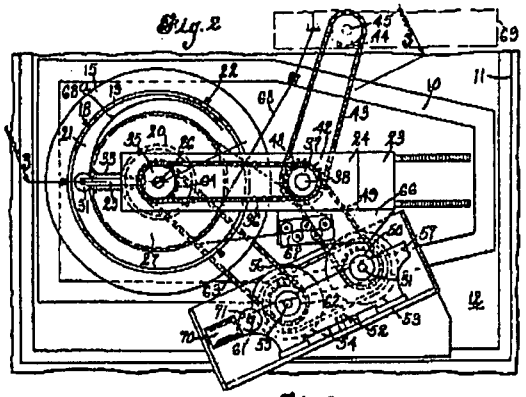


Fig. 4.

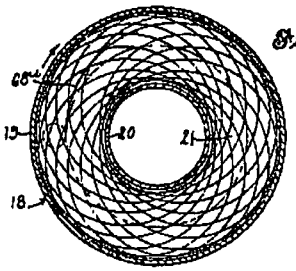


Fig. 5.

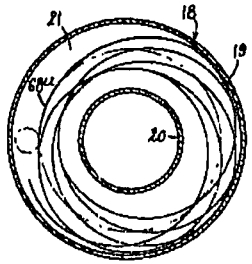


Fig. 6.

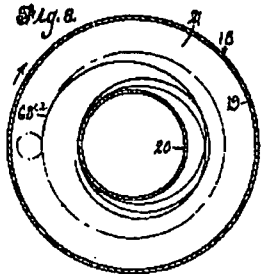


Fig. 3.

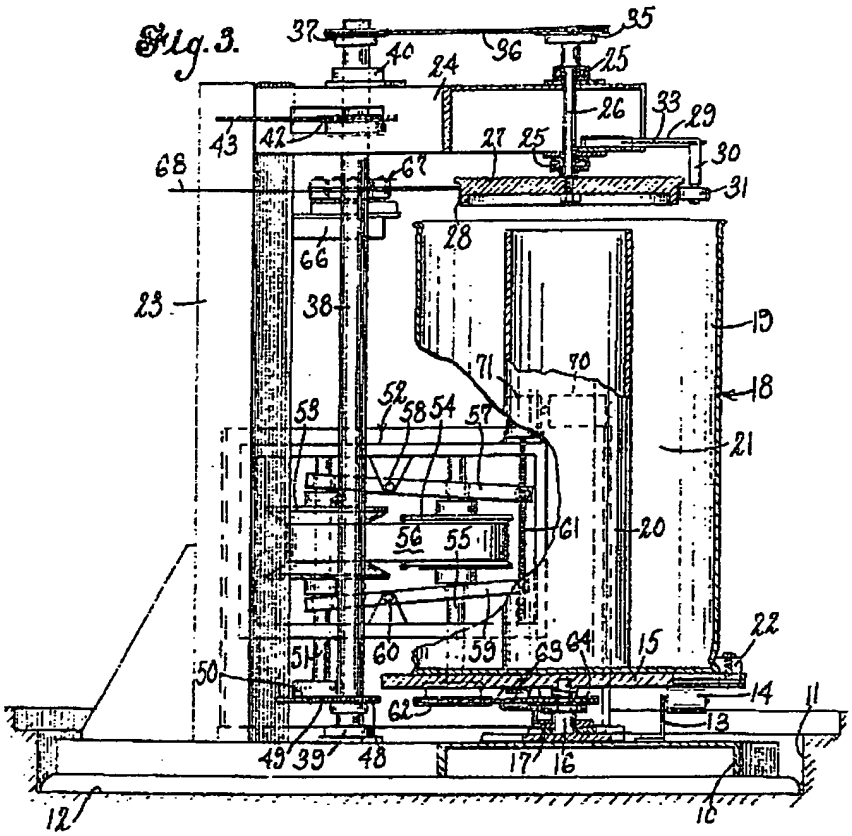
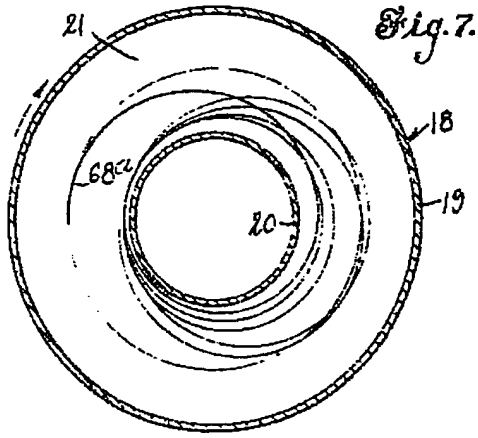

37
35
40
24
36
25
26
33
29
43
42
27
25
30
68
67
31
66
28
23
38
19
71
70
18
53
52
58
54
57
21
56
55
61
20
60
59
63
64
15
22
50
51
14
11
62
13
49
39
48
17
16
12
10

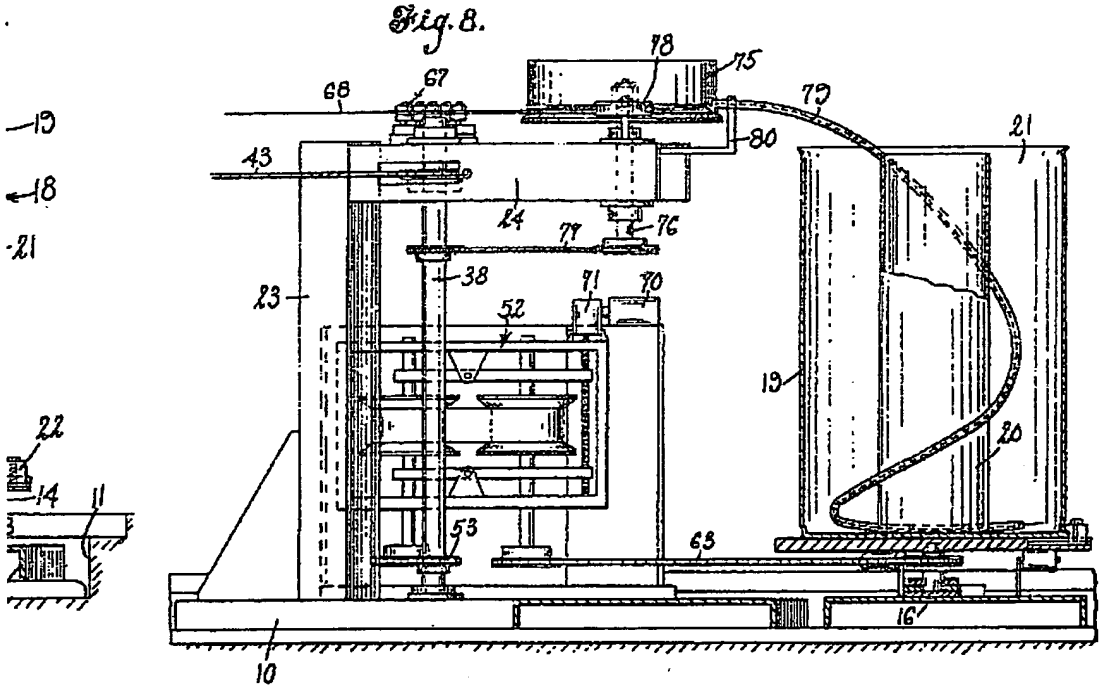
Fig. 7.


21
18
68a
19
20

759,575 COMPLETE SPECIFICATION
4 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 3 & 4

0
31

Fig. 8.



759,575 COMPLETE SPECIFICATION

4 SHEETS

This drawing is a reproduction of the Original on a reduced scale.

SHEETS 3 & 4

Fig. 3.

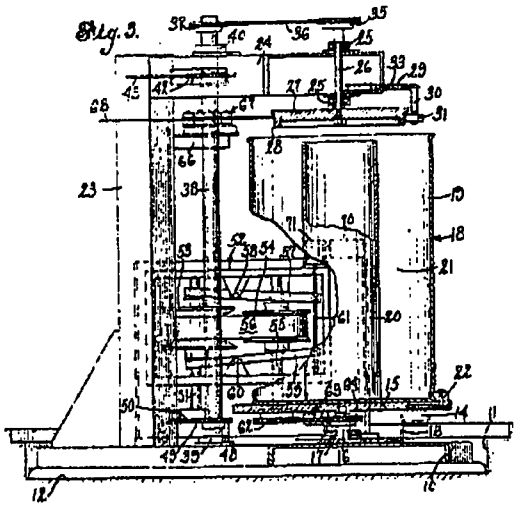


Fig. 8.

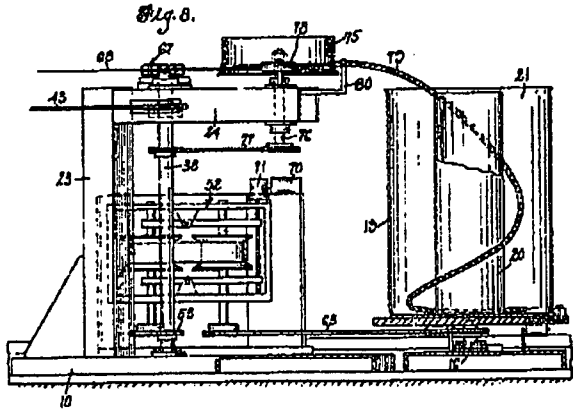


Fig. 7.